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10/571,519	12/20/2006	Juergen Frosien	ZIMR/0034	3269

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EXAMINER	
PURINTON, BROOKE J	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/571,519	Applicant(s) FROSIEN ET AL.	
	Examiner Brooke Purinton	Art Unit 2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _24 February 2009_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-5 and 7-24_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-5 and 7-24_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _24 February 2009_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _25 March 2009_.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4, 12, 14-18, and 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsumi et al. and Baum et al.(USPN 4889995) in view of Baum (WO98/54750) (applicant submitted)

Regarding Claims 1 and 18,Tsutsumi et al. and Baum et al. teach a charged particle beam device (Figure 1, part 2) comprising a charged particle emission component as well as a charged particle emission component for providing a charged particle beam (title), comprising: a first ultra-high vacuum (UHV) (region next to ultra-high vacuum pump 12a, Column 3, line 9, region to be pumped by UHV, ergo UHV region) region wherein the first UHV region does not comprise elements, which essentially block a portion of the charged particle beam (empty space around particle emitter 4 indicates the lack of beam blocking elements, as does the continuation of the beam into the second region, indicating the beam has not been blocked); a second UHV region (region next to ultra-high vacuum pump 12B) and a residual gas diffusion barrier separating the first and the second UHV regions (condenser lens 5, where it acts as a lens and a barrier to gas which is diffusing between the two regions) and wherein the first and the second regions each have a vacuum flange (respective connector between part 2 and parts 12 a and 12b in Figure 1).

Tsutsumi fail to teach wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles.

Baum teaches wherein a residual gas diffusion barrier (18, 25-19,4) is in beam direction directly subsequent to the emitter (Figure 3, emitter 100 and barrier 130) and acts as an electrode for extracting or modulating emitted charged particles (17, 15-20, modulates charged particles).

Modification would have entailed using the same type of cathode shield in the apparatus of Tsutsumi et al. and Baum et al. in the electron source.

It would have been obvious to one of ordinary skill in the art at the time of the invention to make such a modification since the shield is disclosed by Baum as protecting "non emitting areas of the emission surface form contamination and inhibits cathode materials from contaminating components of the electron beam source," (abstract). Additionally, the bias the barrier is held at helps suppress dark current emission (17, 21).

Regarding Claim 2, Tsutsumi et al. and Baum et al. teach a charged particle emission component according to claim 1, Tsutsumi et al. further teach further comprising an emitter in the first UHV region for emitting the charged particle beam (Figure 1, emitter 4).

Regarding Claim 3,Tsutsumi et al. and Baum et al. teach a charged particle emission component according to claim 1, Tsutsumi et al. further teach further comprising an aperture unit (aperture of condenser lens' 5 or 6 in Figure 1) differential pumping between the emission component and a further chamber of a charged particle beam column (shown in Figure 1).

Regarding Claim 4, Tsutsumi et al. and Baum et al. teach a charged particle emission component according to claim 1, Tsutsumi et al. further teach wherein the residual gas diffusion barrier has an opening with a diameter larger than the diameter corresponding to a beam emission angle (see Figure 1).

Regarding Claim 12, Tsutsumi et al. and Baum et al. teach the charged particle emission component according to claim 1, Tsutsumi et al. further teach wherein the first vacuum flange corresponding to the first UHV region and the second vacuum flange corresponding to the second UHV region are connected to separate vacuum pumps (Figure 1).

Regarding Claim 14, Tsutsumi et al. teach a charged particle emission component for providing a charged particle beam (title), comprising: a housing of the charged particle emission component (Figure 1, part 2); an emitter for emitting the charged particle beam with a beam emission angle (Figure 1, part 4); at least one beam shaping element (condenser lens's 5,6) and a residual gas diffusion barrier directly subsequent to the emitter (condenser lens 5), wherein the residual gas diffusion

barrier separates the charged particle emission component into a first and a second ultra-high vacuum (UHV) region (regions next to 12a and 12b respectively, in figure 1, Column 3, line 9, region to be pumped by UHV, ergo UHV region)), wherein the residual gas diffusion barrier has an opening with a diameter larger than the diameter corresponding to the beam emission angle (Figure 1),and wherein the first and the second UHV regions each have a vacuum flange (Figure 1, parts connecting 12a,b and 2).

Tsutsumi fail to teach wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles.

Baum teaches wherein a residual gas diffusion barrier (18, 25-19,4) is in beam direction directly subsequent to the emitter (Figure 3, emitter 100 and barrier 130) and acts as an electrode for extracting or modulating emitted charged particles (17, 15-20, modulates charged particles).

Modification would have entailed using the same type of cathode shield in the apparatus of Tsutsumi et al. and Baum et al. in the electron source.

It would have been obvious to one of ordinary skill in the art at the time of the invention to make such a modification since the shield is disclosed by Baum as protecting "non emitting areas of the emission surface form contamination and inhibits cathode materials from contaminating components of the electron beam source," (abstract). Additionally, the bias the barrier is held at helps suppress dark current emission (17, 21).

Regarding Claim 15, Tsutsumi et al. and Baum et al. teach the charged particle emission component according to claim 14, Tsutsumi et al. further teach wherein the first UHV region does not comprise elements, which essentially block a portion of the charged particle beam (empty space around particle emitter 4 indicates the lack of beam blocking elements, as does the continuation of the beam into the second region, indicating the beam has not been blocked).

Regarding Claim 16, Tsutsumi et al. and Baum et al. teach a charged emission component according claim 14, Tsutsumi et al. further teach comprising an aperture unit for differential pumping between the emission component and a further chamber of a charged particle beam column (Figure 1).

Regarding Claim 17,Tsutsumi et al. and Baum et al. teach a charged particle emission component according to claim 1, Tsutsumi et al. further teach wherein surfaces of the first UHV region are

the surfaces of at least the following components (all comments are regards figure 1): the emitter (part 4), the residual gas diffusion barrier (top of condenser lens, part 5), and a part of the emission component housing corresponding to the first UHV region (area of column 2 next to part 12A), and wherein surfaces of the second UHV region are the surfaces of at least the following components: the at least one beam shaping element (bottom surface of condenser lens 5), a differential pumping aperture (aperture to 12B), and a part of the emission component housing corresponding to the second UHV region (region of column 2 next to 12B).

Regarding Claims 22, 23, and 24, Tsutsumi et al. and Baum et al. teach a charged particle emission component according to claim 1, 14 or 18. Baum further teaches wherein the residual gas diffusion barrier comprises a barrier that separates an emitter and at least one of an anode, a lens, and a differential pressure aperture (Figure 3, part 100 and part 120 separated), wherein the barrier has a central passage between the emitter and the anode or lens (part 132).

Claim 10 isrejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsumi et al. and Baum et al. in view of **Knowles** (USPN 5828064).

Regarding Claim 10, Tsutsumi et al. and Baum et al. teach the charged particle emission component according to claim .

Since they teach the limitations of Claims 1, and the limitations of Claims 10 and 20 are enabled by those limitations in the applicants specification (page 4, 20-24), they also teach wherein the amount of charged particles impinging on surfaces located in the first UHV region is maximal 20% of an amount of charged particles impinging on surfaces located in the emission component.

Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsumi et al. and Baum et al. in view of **Knowle**s (USPN 5828064).

Regarding Claim 19, Tsutsumi et al. teach a method comprising the steps of: evacuating a first ultra-high vacuum (UHV) region (region next to ultra-high vacuum pump 12a, Column 3, line 9, region to be pumped by UHV, ergo UHV region) evacuating a second UHV region (region next to ultra-high

vacuum pump 12B); evacuating at least a further chamber (part 3, Col 8, lines 58-62, "vacuum pump for main pumping and roughing, said ... vacuum pump is connected to said specimen chamber to evacuate air in said specimen chamber,"); and emitting a charged particle beam such that a portion of the charged particle beam is essentially not blocked by the residual gas diffusion barrier within the first UHV region (empty space around particle emitter 4 indicates the lack of beam blocking elements, as does the continuation of the beam into the second region, indicating the beam has not been blocked).

They fail to teach evacuating a first ultra-high vacuum (UHV) region to a maximum pressure of 10^{-8} mbar; evacuating a second UHV region to a maximum pressure of 10^{-8} mbar; and evacuating at least a further chamber to a maximum pressure of 10^{-5} mbar.

Knowles teaches evacuating a first ultra-high vacuum (UHV) region to a maximum pressure of 10^{-8} mbar (“including a high pressure zone of the field emission gum which is maintained at a pressure of approximately 10^{-10} Torr,” 3, 40-50); evacuating a second UHV region to a maximum pressure of 10^{-8} mbar (“a first intermediate zone maintained at a pressure of approximately 10^{-7} Torr," 3, 40-50, where one of ordinary skill in the art would have recognized than an order of magnitude different falls in the range of approximately, without any criticality) and evacuating at least a further chamber to a maximum pressure of 10^{-5} mbar (“a second intermediate vacuum zone maintained at a pressure of approximately 10^{-4} Torr”3, 40-50).

Modification would entail utilizing the method of Tsutsumi et al. and Baum et al. and differentially pumping the vacuum chambers to the pressures disclosed in Knowles.

It would have been obvious to one of ordinary skill in the art to combine the method of Tsutsumi et al. and Knowles since Knowles discloses since this allows the "improved spatial resolution of approximately 2nm comparable to the spatial resolution achieved in high vacuum scanning electron microscopes," (3, 35-40) without vacuum pumping the specimen chamber to a high vacuum and thus saving time and making the process more efficient.

Regarding Claims 10, Tsutsumi et al. teach the charged particle emission component according to claim 1 or Tsutsumi et al. and Baum et al. teach the method according to claim 19.

Since they teach the limitations of Claims 1, and the limitations of Claims 10 and 20 are enabled by those limitations in the applicants specification (page 4, 20-24), they also teach wherein the amount of charged particles impinging on surfaces located in the first UHV region is maximal 20% of an amount of charged particles impinging on surfaces located in the emission component.

Claims 5, 7 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsumi et al. and Baum et al. as applied to claim 1 above and Tsutsumi et al. and Knowles as applied to claim 19 above, and further in view of **Ooaeh** et al. (USPN 5854490).

Regarding Claim 5, Tsutsumi et al. and Baum et al. teach the charged particle emission component according to claim 1.

Baum teaches wherein the residual gas diffusion barrier has an opening for the charged particle beam (Figure 3, part 130).

They fail to teach wherein the opening has a size of at least 1 mm.

Ooaeh et al. teach wherein a barrier has an opening for the charged particle beam, the opening having a size of at least 1 mm ("an aperture A0 f the Wehnelt 42A has a diameter l4 of about 1.5 mm," 2, 38-39).

Modification would entail using this known value in the apparatus of Tsutsumi et al. and Baum et al. which do not specify a value.

It would have been obvious to do this since the aperture of the residual gas diffusion layer needs to be bigger than the majority of the charged particle beam in order to avoid contamination of the electrostatic lens, either due to heating or general degradation. Therefore, in order to keep the electrostatic lens/residual gas diffusion barrier layer from degrading, it would be necessary to allow the beam to travel through it mostly unblocked, as this size would have allowed.

Regarding Claim 7, Tsutsumi et al. and Baum et al. teach charged particle emission component according to claim 1.

They fail to teach it further comprising at least one beam shaping element in the second UHV region wherein the at least one beam shaping element blocks a portion of the charged particle beam by

having an opening for the charged particle beam, the opening having a size corresponding to a beam emission angle less than 5°.

Ooaeh et al. teach at least one beam shaping element in a second region wherein the at least one beam shaping element blocks a portion of the charged particle beam by having an opening for the charged particle beam ("block exposure method, a plurality of blocks each having a respective aperture pattern are provided on the mask 13… the charge-particle beam passes through the aperture pattern of the selected block to have a cross section accordingly shaped," 2, 14-22).

Modification entails using the beam blocking element of Ooaeh et al. in the apparatus of Tsutsumi et al. and Baum et al..

It would have been obvious to use the beam blocking element since one of ordinary skill in the art at the time of the invention would recognize another type of art-recognized beam shaping device.

Both fail to teach that the opening having a size corresponding to a beam emission angle less than 5°.

However, "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). The known conditions are that the beam emission angle is generally between approximately 1 and 180 degrees, as one of ordinary skill in the art would recognize, and therefore finding the opening size which corresponds to a certain optimal value is considered a matter of routine experimentation and not patentably distinctive from other prior art.

Regarding Claim 21, Tsutsumi et al. and Knowles teach the method of operating a charged particle beam device according to claim 19.

Tsutsumi et al. fail to teach wherein a portion of the beam is blocked in the second UHV region, such that the beam is shaped.

Ooaeh et al. teach wherein a portion of the beam is blocked in the second UHV region, such that the beam is shaped ("block exposure method, a plurality of blocks each having a respective aperture pattern are provided on the mask 13… the charge-particle beam passes through the aperture pattern of the selected block to have a cross section accordingly shaped," 2, 14-22).

Modification would entail using the beam blocking method or device of Ooaeh in addition to, or instead of, the condenser lenses of Tsutsumi et al. and Baum et al. in order to shape and manipulate the beam.

It would have been obvious to one of ordinary skill in the art to utilize this blocking to shape the beam since after the blocking occurs "the shaped cross section pattern ... is reduced in size to be projected onto the wafer. In this manner, one shot of the charged particle beam can create a various fine pattern on the wafer," (2, 20-24) and would require less energy than exerting an electrostatic lens to do the same job, thus increasing the energy efficiency of the instrument or method in question.

Claims 8, 9 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsumi et al. and Baum et al.as applied to claim 1 above and further in view of **Ishida et al.** (USPN 6031235).

Regarding Claim 8, Tsutsumi et al. and Baum et al. teach the charged particle emission component according to claim 1.

They fail to disclose wherein the first and the second UHV regions have in operation a maximum pressure of 10^{-8} mbar.

They fail to disclose wherein the first and the second UHV regions have in operation a maximum pressure of 10^{-8} mbar (Ishida discloses an embodiment where the two UHV chambers of their disclosure are operated at maximum pressures of 10^{-8} Torr, 3, 53-57).

Modifying Tsutsumi et al. and Baum et al. by Ishida et al. means changing the vacuum pumping to create this vacuum atmosphere.

It would have been obvious to pump it at these optimal pressures since Ishida et al. disclose that these pressures allows the user to obtain a stable field emission current (1, 25-30).

Regarding Claim 9, Tsutsumi et al. and Baum et al. teach the charged particle emission component according to claim 1.

They fail to teach wherein the first and the second UHV regions have in operation a maximum pressure difference of one order of magnitude.

Ishida et al. teach wherein the first and the second UHV regions have in operation a maximum pressure difference of one order of magnitude (3, 53-57 where an embodiment disclosed is 10^{-9} and the second vacuum container would be 10^{-8})

Motivation to combine is the same as given in regards to Claim 8.

Regarding Claim 13, Tsutsumi et al. and Baum et al. teach a charged particle emission component according to claim 1.

They fail to explicitly teach wherein the residual gas diffusion barrier is an isolating aperture and the first and the second UHV regions are UHV chambers.

Ishida et al. calls his differentially pumped regions chambers and has a gas diffusion barrier which is an isolating aperture (Figure 1, chambers are clearly shown as the parts separated by isolating aperture 14).

Modification of Tsutsumi et al. and Baum et al.would incorporate the isolating aperture of Ishida.

It would have been obvious to have differently pumped chambers and an isolating aperture between the two in order to better control the pressure of the electron emitter and create a stable electron beam environment.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsumi et al. and Baum et al.as applied to claim 1 above and further in view of **Wegman** (USPN 3206598).

Regarding Claim 11, Tsutsumi et al. and Baum et al. teach the charged particle emission component according to claim 1.

They fail to teach wherein the first vacuum flange corresponding to the first UHV region and the second vacuum flange corresponding to the second UHV region are connected to one vacuum pump.

Wegman teaches wherein the first vacuum flange corresponding to the first UHV region and the second vacuum flange corresponding to the second UHV region are connected to one vacuum pump (Figure 1, flanges connect two chambers to first one and then a secondary pump, effectively connecting the two flanges to the same pump).

Modification would entail attaching both vacuum flanges of Tsutsumi et al. and Baum et al.to the same vacuum pump.

It would have been obvious to one of ordinary skill to substitute the separate vacuum flanges going to the same pump of Wegman (one known element) for the separate vacuum flanges going to different, respective pumps as per Tsutsumi et al. and Baum et al.(another known element) in order to obtain the predictable result of still being able to pump down the chamber components and run the electron beam.

Response to Arguments

Applicant's arguments with respect to claims 1-18 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments with respect to claims 19-24 have been fully considered but they are not persuasive.

In response to applicant's arguments, the recitation "wherein the charged particle beam device has a residual gas diffusion barrier that is in beam direction directly subsequent to an emitter and acts as an electrode for extracting or modulating emitted charged particles", has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action

is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brooke Purinton whose telephone number is 571.270.5384. The examiner can normally be reached on Monday - Friday 7h30-5h00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on 571.272.2293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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